

Abstract of the Disclosure

Disclosed is a chemical microreactor that provides a means to generate hydrogen fuel from liquid sources such as ammonia, methanol, and butane through steam reforming processes when mixed with an appropriate amount of water. The microreactor contains capillary microchannels with integrated resistive heaters to facilitate the occurrence of catalytic steam reforming reactions. Two distinct embodiment styles are discussed. One embodiment style employs a packed catalyst capillary microchannel and at least one porous membrane. Another embodiment style employs a porous membrane with a large surface area or a porous membrane support structure containing a plurality of porous membranes having a large surface area in the aggregate, i.e., greater than about $1 \text{ m}^2/\text{cm}^3$. Various methods to form packed catalyst capillary microchannels, porous membranes and porous membrane support structures are also disclosed.